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Some parmelioid lichens new to Turkey and Asia

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Abstract — Five parmelioid species of lichenized fungi — *Myelochroa aurulenta, Parmelinopsis minarum, Parmotrema hypoleucinum, Parmotrema reticulatum* and *Xanthoparmelia verrucigera* — are reported as new to Turkey. *Parmotrema hypoleucinum* and *Xanthoparmelia verrucigera* are also new to Asia while *Parmelinopsis minarum* and *Parmotrema reticulatum* are new to the Middle East. Geographic distribution, substrate, chemistry, and comparisons with morphologically similar taxa are presented.

Keywords — Ardahan, *Ascomycota*, biodiversity

Introduction

In comparison with other countries, prior to the present decade few lichen studies have been conducted in Turkey, so that the lichen biota of Turkey remains poorly known. Recently, however, many new lichen taxa have been recorded for Turkey (Aptroot & Yazici 2009, Candan & Özdemir Türk 2008, Etayo & Yazici 2009, Yazici et al. 2008a,b, Yazici & Aptroot 2008). Five lichenized fungi new to Turkey and Asia are described below.

Material and methods

The present report is based on collections from Ardahan region made between 15–20 August 2008. Air dried samples were observed and studied with a Nikon SMZ1500 stereomicroscope and a Nikon Eclipse 80i light microscope using standard identification methods for lichenized fungi. The nomenclature and genera and species concepts follow Hale (1974), Elix & Hale (1987), Elix (1994),

Brodo et al. (2001), Louwhoff & Elix (1999, 2002), Elix & Wardlaw (2000), Blanco et al. (2004, 2005), Divakar & Upreti (2005), Marcelli & Canêz (2008). Natural chemical products have been identified by Standard TLC and HPLC procedures. Vouchers are stored in the herbarium of the Biology Department, Faculty of Sciences and Arts, Karadeniz Technical University, Trabzon, Turkey (KTUB).

Species

Myelochroa aurulenta (Tuck.) Elix & Hale, Mycotaxon 29: 240. 1987.

Specimen examined: Ardahan, Posof, center (Control Tower Forests), 41°31'36.83"N, 42°44'03.48"E, on moss and calcareous rock, 1920m, 20.08.2008, KTUB 2021.

Thallus moderately adnate, to 12 cm wide. Lobes sublinear to subirregular, 2–4 mm wide, or rounded, contiguous or imbricate, older lobes centrally contorted, sublinear, subdichotomously to irregularly branched, 2–4 mm wide; margins entire or crenate, ciliate; cilia, simple, short, sparse to ± dense, mostly concentrated in lobe axils. Upper surface pale grey to grey-green, sorediate to pustulate-sorediate, ± maculate, ± pruinose, smooth, becoming rugulose centrally with distinct, cracked areas exposing the medulla; soralia laminal, ± dense, some soralia with granular soredia, coalescing into large, subcapitate clumps. Medulla whitish to pale yellow, sometimes ± sulphur-yellow. Lower surface black with a brown marginal zone (1–5 mm wide), smooth to rugulose, ± densely rhizinate; rhizines black, simple to sparsely furcate or squarrose branched. Apothecia and pycnidia not seen. Cortex K+ yellow, medulla K–,C–, KC–, P–; containing atronorin acid (minor), zeorin (major), leucotylic acid (major), secalonic acid A (minor).

Myelochroa aurulenta is a pantemperate to pantropical or Mediterranean lichen species, occurring on bark, walls in small urban areas, rarely on inclined calcareous rocks along roadsides and also in disturbed vegetations and gardens at altitudes of 700–1700 m.

Collection site — In the collection area dominate microclimatic conditions with mild and rainy winters and hot summers. Mean annual temperature is 6.8°C. Mean annual rainfall is 600 mm. The collection site was more or less well lit and open with a stream and *Pinus* trees dominant in the vicinity.

Known distribution: Africa, Asia (China, Georgia, India, Korea, Japan, Thailand), Australia, North America and the Pacific [the Hawaiian Islands, Papua New Guinea]. New to Turkey.

Remarks—*Myelochroa aurulenta* is similar to *Hypotrachyna endochlora* (Leight.) Hale and *Myelochroa supraflava* Canêz & Marcelli. All three species have pigmented medulla and pustulate-sorediate upper surface, but *H. endochlora* has richly dichotomously branched rhizines and is distinguished by the absence of marginal cilia. *M. aurulenta* has sublinear to subirregular or rounded lobes, simple to barely forked or squarrose rhizinae, and distinct,

cracked areas exposing white to yellow patchy medulla. *Myelochroa supraflava* is distinguished by the upper medulla being yellow throughout and in having mainly simple rhizines.

Parmelinopsis minarum (Vain.) Elix & Hale, Mycotaxon 29: 243. 1987.

Specimen examined: Ardahan, Posof, Kurşunçavuş village, near the stream, 41°31'37.76"N, 42°37'16.40"E, on *Pinus* sp., 1790 m, 15 August 2008, KTUB 2019.

Thallus adnate, to 2–7 cm wide; lobes contiguous, sublinear-elongate, ± dichotomously branched, 1–3 mm wide; cilia irregularly dispersed, mostly simple, to 0.7 mm long. Upper surface whitish to pale greenish-grey, flat to convex, shiny, emaculate, smooth, without soredia and pustules; isidia mostly branched, cylindrical, to 0.5 mm tall, erect, eciliate, dense. Medulla white. Lower surface black; rhizines shiny, simple or sparingly furcate, moderately dense, black. Apothecia very rare; thalline exciple isidiate. Cortex K+ yellow; medulla P–, K–, C+ pink, KC+ red. Ascospores 12–17 × 8–10 µm. Pycnidia rare. Conidia cylindrical, 3–4 × 0.5 µm, containing atranorin acid (minor), chloroatranorin acid (minor), gyrophoric acid (major), umbilicaric acid (minor).

Parmelinopsis minarum grows on bark and rock in moist forests. It s a cosmopolitan species that has been reported from all continents except Antarctica. The species grows on bark of different trees and rocks in moist forests covering Mediterranean zone around the World

Collection site – The Turkish specimen of *P. minarum* has been found in more or less well-lit and open locality covered with a stream and occasional *Corylus*, *Populus*, *Salix*, *Carpinus* and *Picea orientalis*. Microclimatic conditions with mild and rainy winters and hot summers dominate in the study area. Mean annual temperature is 6.8ºC. Mean annual rainfall is 600 mm.

Known distribution: Europe, Africa, Asia, Australia, North America, South America, New Zealand and Papua New Guinea. New to Turkey and Middle East.

Remarks—*Parmelinopsis minarum* is very similar to *P. horrescens* (Taylor) Elix & Hale. In *P. minarum* the isidia are cylindrical and ± branched and very rarely ciliate at the apices, whereas the isidia in *P. horrescens* are typically coralloid-lobulate and apically ciliate. Moreover, *P. horrescens* produces 3-methoxy-2,4-di-*O*-methygyrophoric and 2,4-di-*O*-methylgyrophoric acids as the major medullary substances (C–), while *P. minarum* contains gyrophoric acid (C+ pink) rather than gyrophoric acid.

Parmotrema hypoleucinum (J. Steiner) Hale, Phytologia 28(4): 336. 1974.

Specimen examined: Ardahan, Posof, center (Control Tower Forests), near the stream, 41°31'36.83"N, 42°44'03.48"E, on *Pinus* sp., 1918 m, 20.08.2008, KTUB 2022.

Thallus pale greenish-gray to white, with vague to distinct white maculae on the upper surface; lower side dark-brown sometimes pale with a broad bare white zone at the margins, black in the center; lobes dull, suberect upper cortex

continuous, 3–15 mm wide and often curled back showing ivory-white patches; when maculate, the maculae not reticulately arranged but scattered. Soralia patchy, linear or round to diffuse, occasionally pustulate or submarginal. Cilia well developed, long, quite sparse at the lobe apices but more abundant in lobe axils. Medulla white (sometimes with patches of orange-red skyrin near lower cortex; in decaying plants salazinic acid may cause red staining). Apothecia rare. Cortex K+ yellow; medulla P+ orange, K+ yellow to orange, KC–, C–, I+ blue, containing atranorin acid (minor), stictic acid (major), cryptostictic acid (minor), menegazziaic acid (minor), norstictic acid (minor).

Parmotrema hypoleucinum is a mediterranean-atlantic lichen, found on twigs of trees and shrubs in undisturbed Mediterranean maquis along the coast.

Collection site – See *Myelochroa aurulenta* above.

Known distribution: Western and southern Europe, North America. New to Turkey and Asia.

Remarks—*Parmotrema hypoleucinum* is morphologically identical to *P. hypotropum* (Nyl.) Hale, but *P. hypotropum* is distinguished by the presence of norstictic and connorstictic acids and colour reactions of medulla (P+deep yellow, K+ yellow turning red and I–). *Parmotrema hypoleucinum* differs from the more common *P. perlatum* (Huds.) M. Choisy in being sparsely ciliate, white at under site of lobe margins and containing minor amounts of norstictic acid.

Parmotrema reticulatum (Taylor) M. Choisy, Bull. mens. Soc. linn. Lyon 21: 148. 1952.

Specimen examined: Ardahan, Posof, center (Control Tower Forests), 41°31'36.83"N, 42°44'03.48"E, on moss and *Pinus* sp., 1920m, 20.08.2008, KTUB 2017.

Thallus loosely adnate, coriaceous, up to 10–20 cm wide. Lobes ± imbricate along margins, subirregular to sublinear, ± rounded at apices; margins entire to irregularly-incised or laciniate-dissected, ciliate. Cilia slender, simple, up to 1 mm long, moderately dense to dense. Upper surface pale grey-green, effigurately maculate, soon reticulately cracked, sorediate. Soralia marginal, linear or subcapitate at apices of laciniae which become subrevolute; soredia granular, occasionally spreading laminally. Medulla white. Lower surface black, centrally rhizinate, rhizines extending to lobe margins, or present a thin, brown, shiny, erhizinate marginal zone. Rhizines, black, simple or squarrosely-branched, soon forming dense clumps. Apothecia rare, submarginal, 3–5(–8) mm wide; thalline exciple entire or ± crenulate, sorediate; disc imperforate, or soon perforate, brown. Ascospores ellipsoid to subglobose 10–16.5 × 7.5–10 µm. Cortex K+ yellow, medulla K+ yellow than red, C–, P+ deep orange/red; containing atronorin acid (minor), salazinic acid (major), consalazinic acid (minor).

This is a mediterranean-atlantic to temperate lichen, widespread throughout the tropics and temperate areas. It occurrs on bark of different trees, rarely on mossy siliceous rocks at altitudes of 780–2360 m.

Collection site – See *Myelochroa aurulenta* above.

Known distribution: Europe, Asia, Africa, Australia, North and South America. New to Turkey and Middle East

Remarks—*Parmotrema reticulatum* resembles *P. cristiferum* (Taylor) Hale, but the marginal laciniae and cilia, the branched rhizines which extend to the lobe margin and the reticulately cracked upper cortex distinguish *P. reticulatum* from the later. *P. cristiferum* is eciliate and has simple rhizines and a bare marginal zone on the lower surface.

Xanthoparmelia verrucigera (Nyl.) Hale, Smithson. Contr. bot. 74: 220. 1990.

Specimen examined: Ardahan, Posof, Kurşunçavuş village, near the stream, 41°31'37.76"N, 42°37'16.40"E, on siliceous rock, 1790 m, 15 August 2008, KTUB 2023.

Thallus up to 6 cm wide, saxicolous, foliose, adnate to tightly adnate; lobes contiguous, subirregular to sparingly imbricate, irregularly branched, upper surface yellow green, moderately to densely isidiate. Isidia simple, cylindrical or rarely sparsely branched and verrucose. Medulla white. Rhizines sparse to moderately dense, simple, black, concoloured with the lower surface of thallus. Cortex K–, C–, KC+ pale yellow, P–. Medulla K+ persistent yellow, C–, KC+ red, P+ orange. Apothecia and pycnidia not seen. Stictic (major), constictic (minor), lusitanic (minor) and verrucigeric (minor) acids present.
Xanthoparmelia verrucigera prefers siliceous rocks, but also occur on basic or ultrabasic substrata such as basalt or tuff.

Collection site – See *Parmelinopsis minarum* above.

Known distribution: Africa: Zimbabwe, Australia, Europe (France, Portugal, Romania, Spain, Hungary, Italy), Pacific Islands: Pascua, Rapa Nui, North America. New to Turkey and Asia.

Remarks—Morphologically *X. verrucigera* resembles *X. subverrucigera* O. Blanco, A. Crespo & Elix and *X. conspersa* (Ach.) Hale, but *X. subverrucigera* has a brown lower surface (jet-black in the other two species). *X. conspersa* differs from *X. verrucigera* in the chemistry, since it contains stictic (major), constictic (submajor), cryptostictic (minor), norstictic (minor), connorstictic (trace), ± menegazziaic (trace) and ± hyposalazinic acids (trace) but lacks lusitanic and verrucigeric acids found in the later species. Molecular studies have shown that *X. conspersa* and *X. verrucigera* are not closely related (Blanco et al. 2004).

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